Available online at www.sciencedirect.com

SCIENCE DIRECT

Biochimica et Biophysica Acta 1694 (2004) 3–4

BIOCHIMICA ET BIOPHYSICA ACTA BBA

http://www.elsevier.com/locate/bba

Editorial

A top runner of the flagellar world has unexpectedly gone

Shin-Ichi Aizawa*

The Aizawa Team, Soft Nano-Machine Project, CREST, Japan Science and Technology Agency c/o Kochi Sangyo, 1064-18, Shioya-gun, Tochigi, Japan

Received 12 February 2004; accepted 12 February 2004

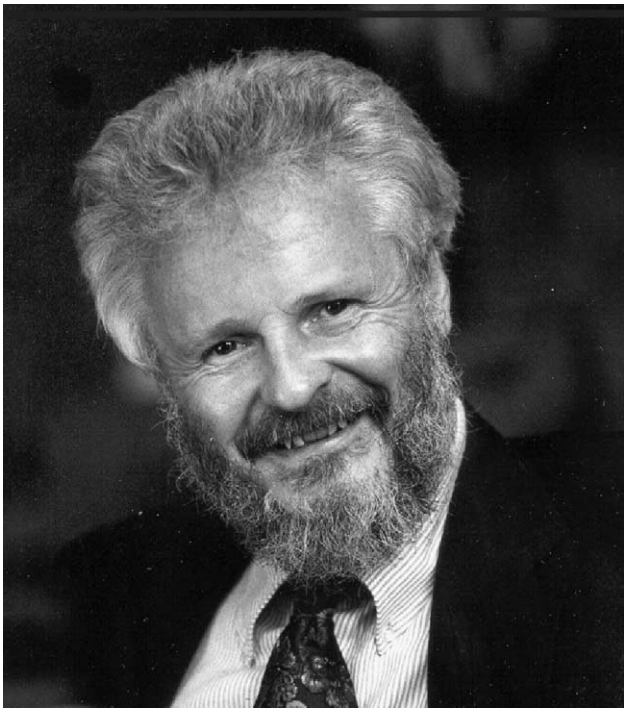

Photo 1.

Robert M. Macnab, a Yale Professor, died on 7th September 2003, from an accidental fall at his home. His untimely and tragic death at only 62 years of age inevitably leads us to remember a wonderful man and a dedicated scientist who contributed so much throughout his career. Bob Macnab was not only a much respected colleague, but also a friend, and as such I dedicate this brief summary of his work to his memory.

Bob started his career as a BP petrochemist and then during his PhD course at Berkley, diverted his interest towards biological phenomena, especially to that of bacterial behaviour. Eventually, at Yale, he settled on studying flagella, the machinery of bacterial motility.

Bacteria can sense chemicals and move towards the source when conditions are favourable. We observers can see bacteria swimming up the spatial gradient of chemicals. Bob interpreted this as a temporal gradient from the bacterial point of view; bacteria do not understand space but sense the changes in chemical concentration from time to time. The discovery that such a simple creature as a bacterium is able to have a short (brief) memory changed the entire notion of these primitive creatures. The flagellar filaments were thought to be invisible by optical microscopy, because the thickness of the filament (20 nm) was far below the wavelength of observable light (400 nm). Bob broke this long-time superstition. Scattered light from the filament illuminated by a strong light source could be observed on a dark background, like stars in the night sky. The greenish glow of flagellar filaments freely moving around a cell was one of the most impressive and unforgettable images in microbiology.

I was fortunate enough to spend four and a half postdoctoral years in the Macnab lab. This was obviously a much longer stay than the average for most postdocs. Putting aside my own slow talent for science, his lab was such a comfortable place to stay; the daily work was secured by his beloved wife May's motherly support, and late-afternoon discussions over the results of the day were stimulated by Bob's unbeatable logic. All I could ever do to match him was to work hard and present a result that challenged one of his theories. They were very cherished days.

The flagellum consists of more than 20 component proteins and 50 genes are involved in controlling its assembly, a system as complicated as the ribosome. During my stay, we developed a method to purify the whole flagellum. Since then, Bob dedicated himself to structural analysis of the flagellum. We now know almost all the components of the flagellum, the gene–protein structure relationship and the assembly process.

As we have studied further into the flagellar base, it has revealed the more complicated aspects of a gigantic protein

* Tel./fax: +81-28-676-8510.
E-mail address: aizawa@softnano.org (S.-I. Aizawa).

0167-4889/$ - see front matter
doi:10.1016/j.bbamcr.2004.02.006

complex. As you will find in his article (probably his last one) of this special issue, the flagellum belongs to the family of type III protein secretion systems, which are commonly found in pathogenic species. His analysis of the flagellar export apparatus, including the chaperones that carry the substrates, is meticulous and thus leading the field.

In addition to structural analysis of the flagellum, Bob paid attention to other areas surrounding this field. One of his many achievements that have been ignored is the introduction of the unified nomenclature for flagellar genes. Before 1985, people had to use the unorganised and sporadic names the geneticists gave for each strain. Bob patiently persuaded all those involved and succeeded in introducing the new and more organised nomenclature. Today, this system has been widely used for flagella of all species. I do appreciate his diplomatic victory (he was the only non-geneticist among them) especially when I see the confusion of gene nomenclature in other type III systems. Bob was a man of reasonability and foresight in the flagellar world and will be sorely missed (Photo 1).